

# ***Climate Change Scenario Planning:***

***A Tool for Managing Resources  
in an Era of Uncertainty***



Joshua Tree National Park

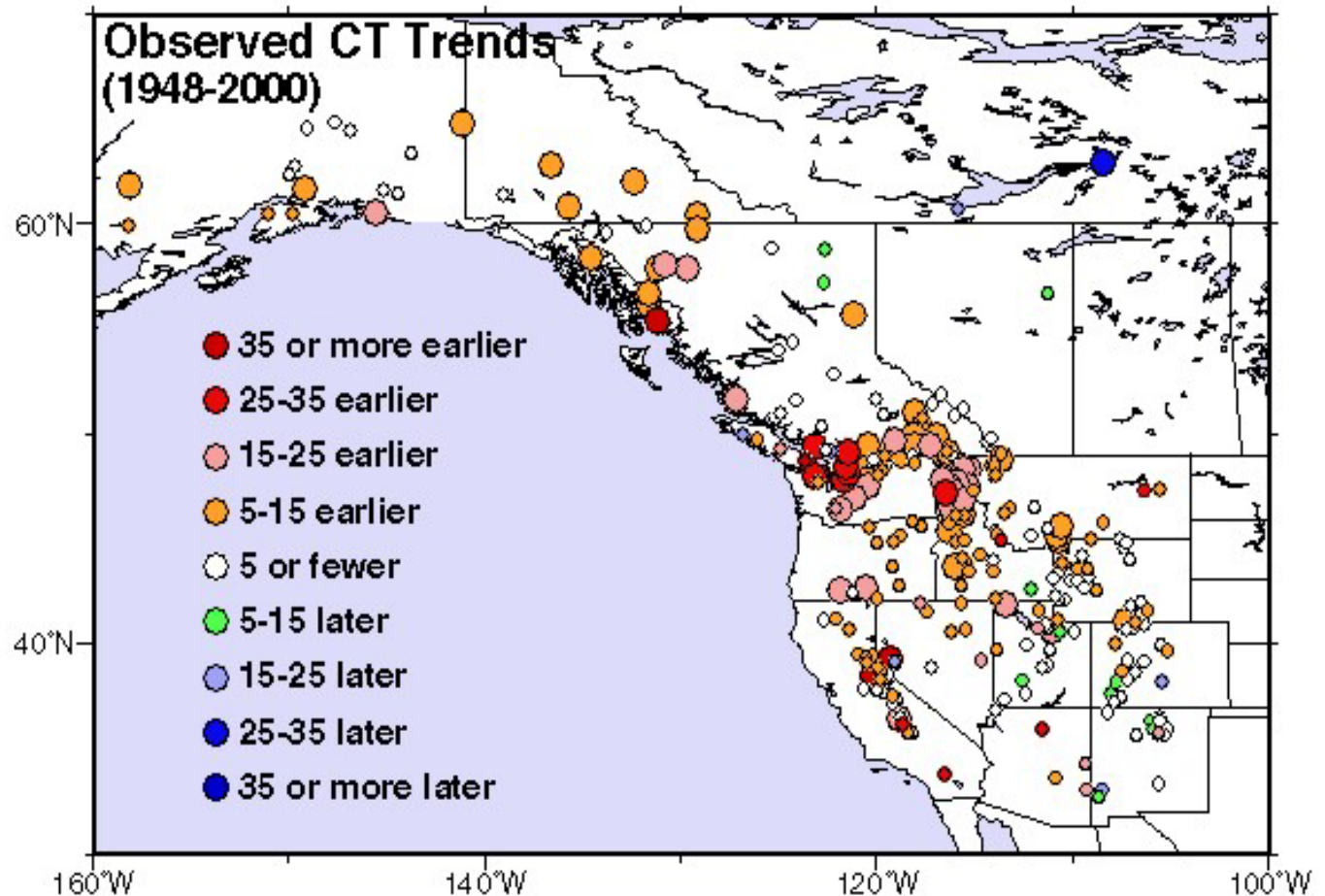
Kaloko-Honokohau NHP



# Snowmelt flows have been starting earlier

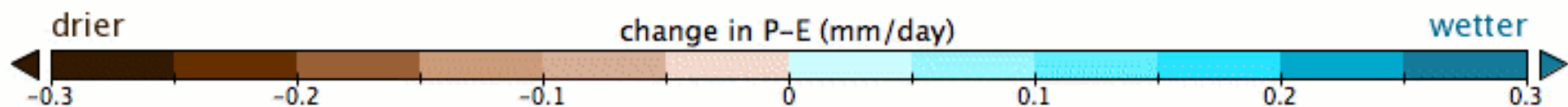
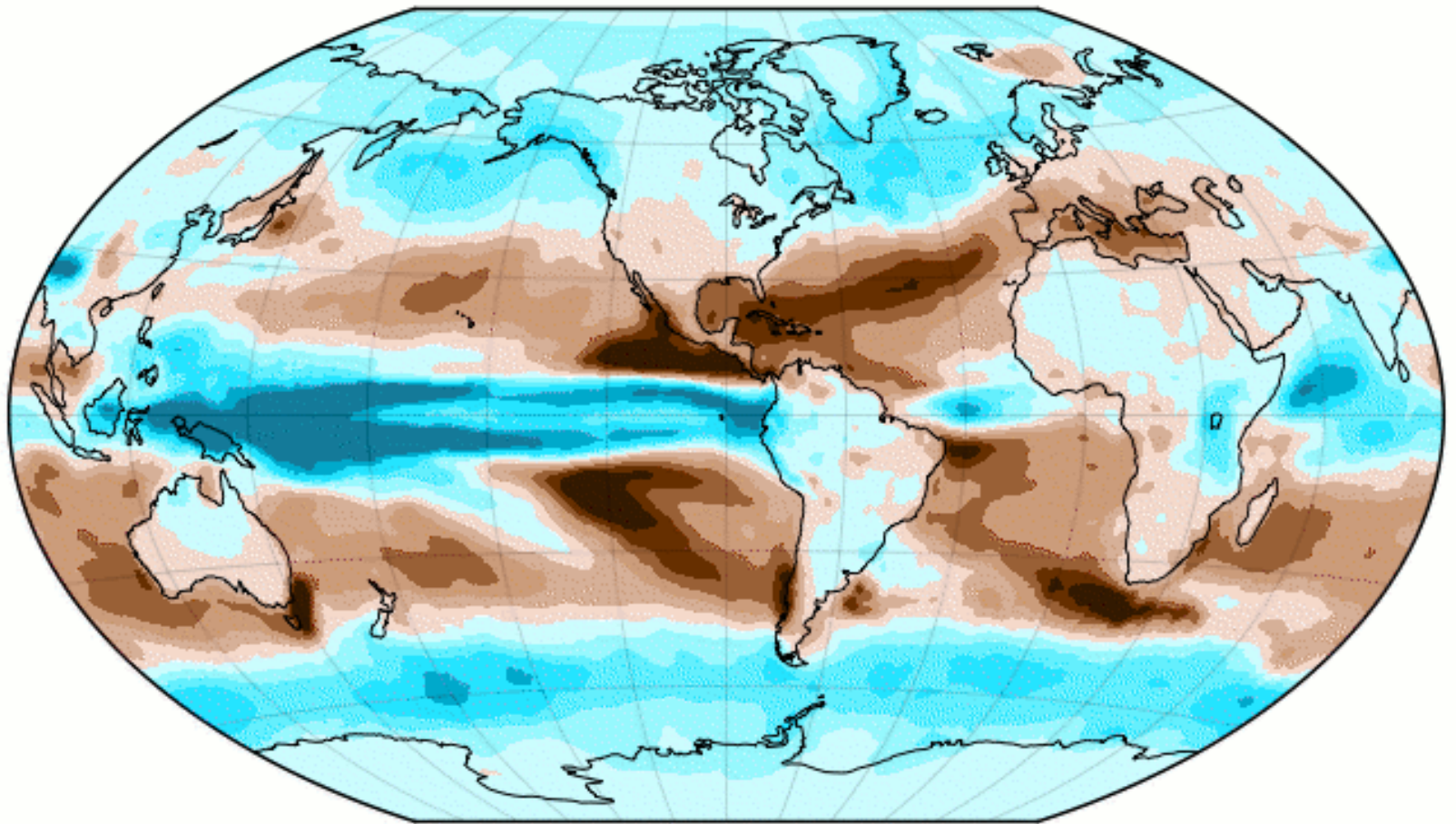


**“Center Timing”  
of many  
snowmelt  
watersheds  
has advanced  
by 1-4 weeks  
earlier across  
the West during  
last 3 decades**



Source: Iris Stewart, Daniel R. Cayan, and Michael D. Dettinger, 2004. Changes in snowmelt runoff timing in western North America under a 'Business as Usual' climate change scenario: *Climatic Change*, 62, 217-232.

Change in P-E (2021-2040 minus 1950-2000)

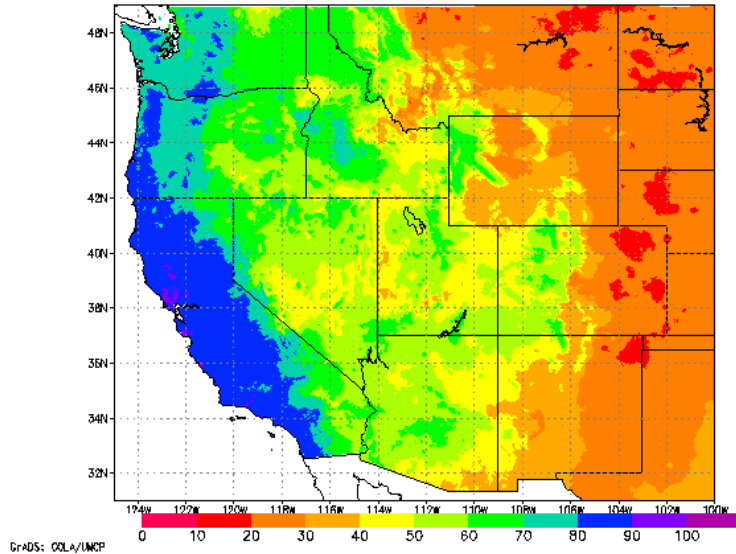


Winkel Tripel projection centered on -90.0°E

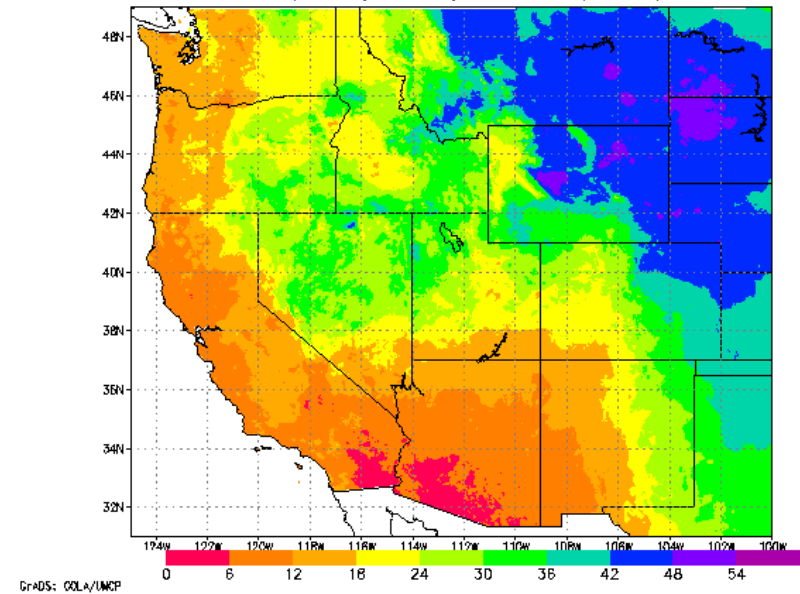
Warmer climate causes mid-latitude drying

Seager et al 2007

Percent of Average Annual Precip  
in Oct-Mar (PRISM OSU/WRCC)



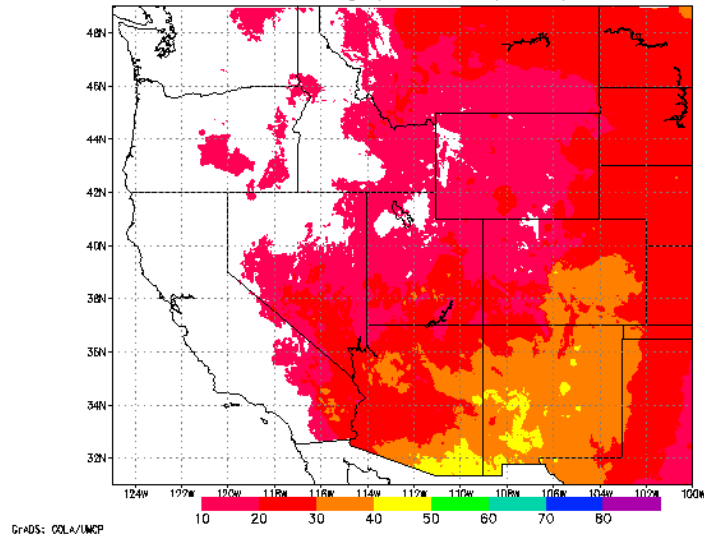
Percent of Average Annual Precip  
in Apr-May-Jun (PRISM OSU/WRCC)



Oct-Mar

Apr-May-June

Percent of Average Annual Precip  
in Jul-Aug (PRISM OSU/WRCC)

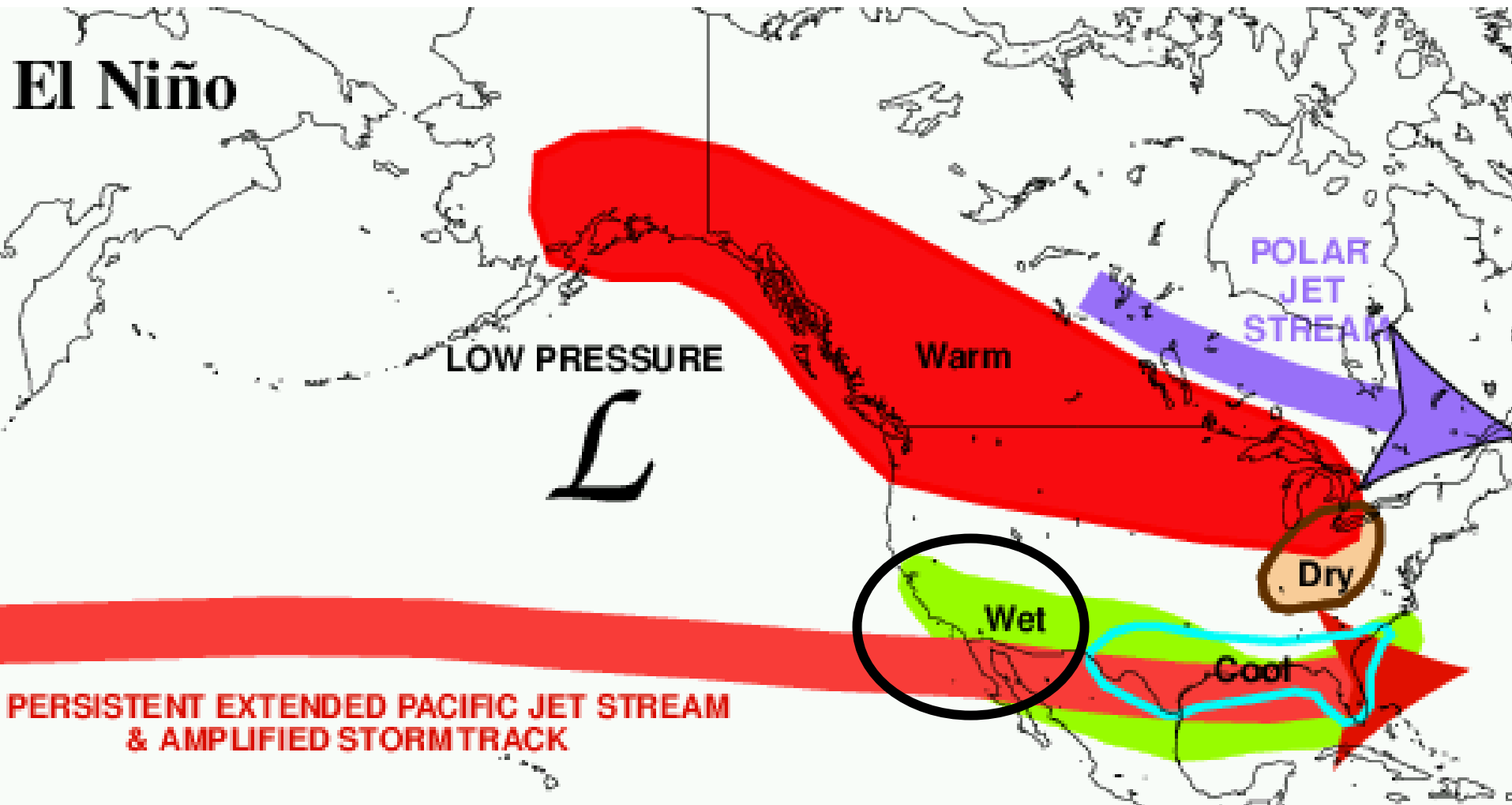


July-Aug

## Fraction of Annual Total Precipitation, by Season

source: Kelly Redmond, WRCC

# El Niño enhances monsoon rains during winter months



January through March Patterns

# Climate Change Scenario Planning

## Workshop held Nov 13-14, 2007



### Goals:

- Challenge assumptions about the future
- Foster strategic thinking about how to respond in different situations
- Gain insight into how to manage change and plan in the face of uncertainty





# Scenario Planning

## Scenarios Are:

- A tool for long-term strategic planning
- Compelling narratives of alternative environments in which decisions may be played out
- Coherent, internally consistent, and plausible

## Scenarios Are Not:

- Predictions or Forecasts
- A method for arriving at the “most likely” future



# Scenario Planning as part of the Planning Toolkit

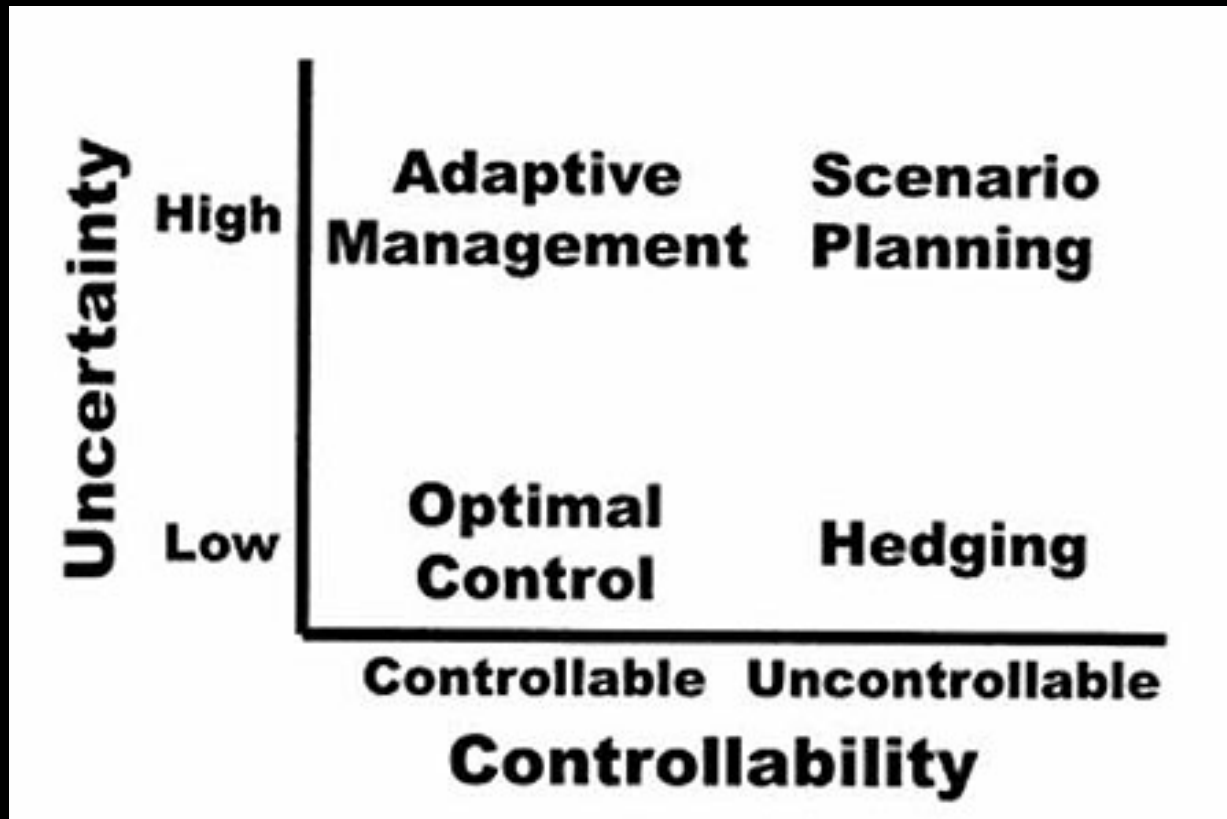
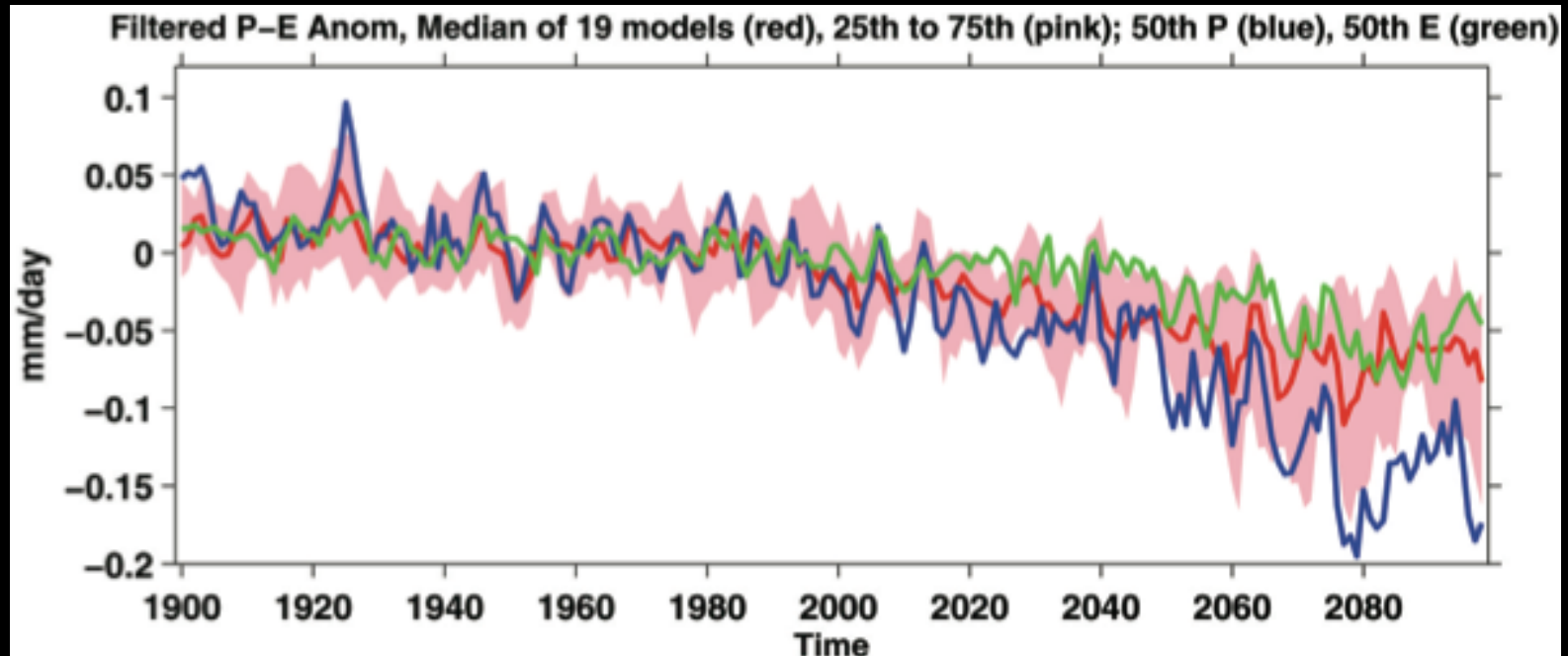


Figure from Peterson et al. Conservation Biology  
Volume 17, No. 2, April 2003

# Examples of Scenario Exercises: Tucson Water



Southwest Surface Water Availability (P-E)



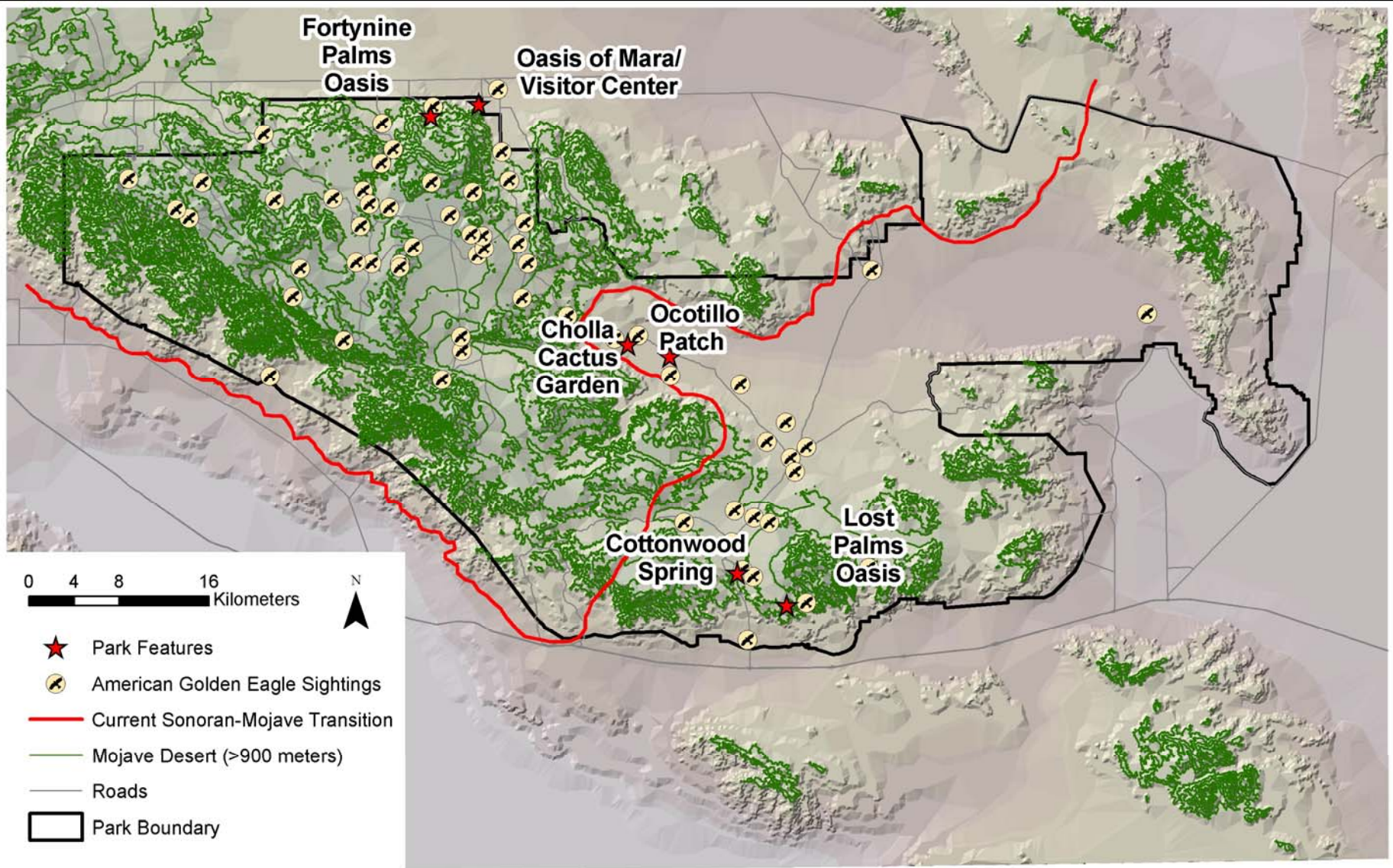
# Comparison of 3 Scenarios for JOTR

	Summer Soaker	When it Rains it Pours	Dune
IPCC Emission Scenario	B1	A1B	A1F
Rate of CO <sub>2</sub> emissions	Slowest rate of increase	Increases moderately	Steepest rate of increase
Temperature	Increases	Increases	Increases
Precipitation	Decreases in winter and spring; <b>increases in summer</b> ; little or no change overall	<b>Increase in extremes</b> (drought in summer, storms in winter); overall decrease	<b>Decreases overall</b> and seasonally
Vegetation: <b>non-native annual grasses</b>	<b>Decrease</b> in current community; potential new suite of invasives emerge	<b>Increase</b>	Increase initially; decrease over time
Vegetation: <b>native grasses</b>	<b>Increase</b>	<b>Decrease</b>	Decrease
Vegetation: Joshua trees and other woody veg	Decrease and move to higher elevations	Decrease	Decrease
Fire regime	Slightly more intense, <b>mosaic</b> pattern	<b>More intense</b> , mainly after wet years	More intense initially, <b>decrease over time</b> as vegetation decreases
Native animal species	Decrease in Mojave species, increase in Sonoran species	Decrease	Decrease



# *“Summer Soaker”*

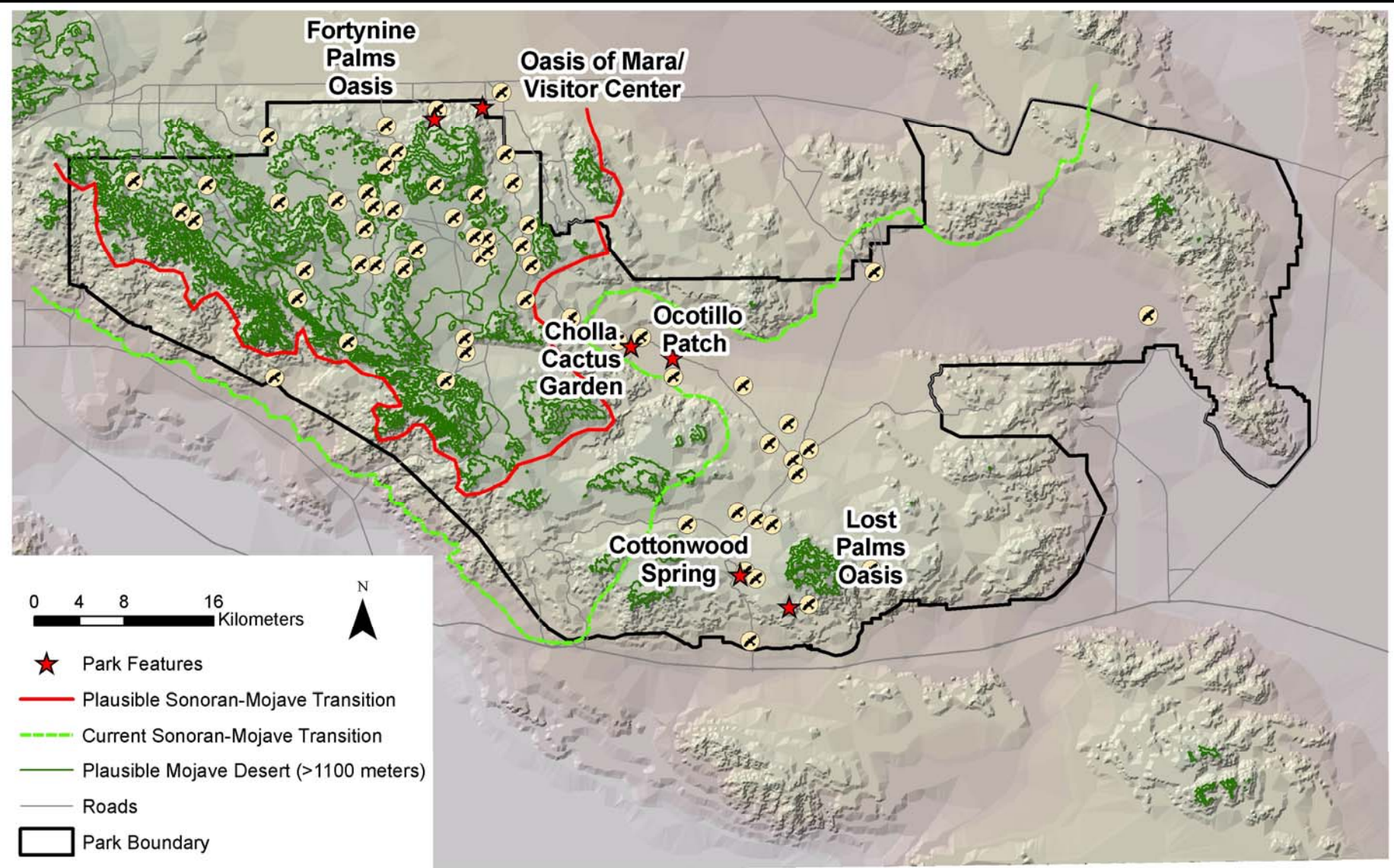
**Current Mojave Desert: > 900 meters in elevation**





## *“Summer Soaker”*

Plausible future Mojave Desert: **> 1100 meters in elevation**





## ***“Summer Soaker”***

### **Expansion of Sonoran ecosystem**





## ***“Summer Soaker”***

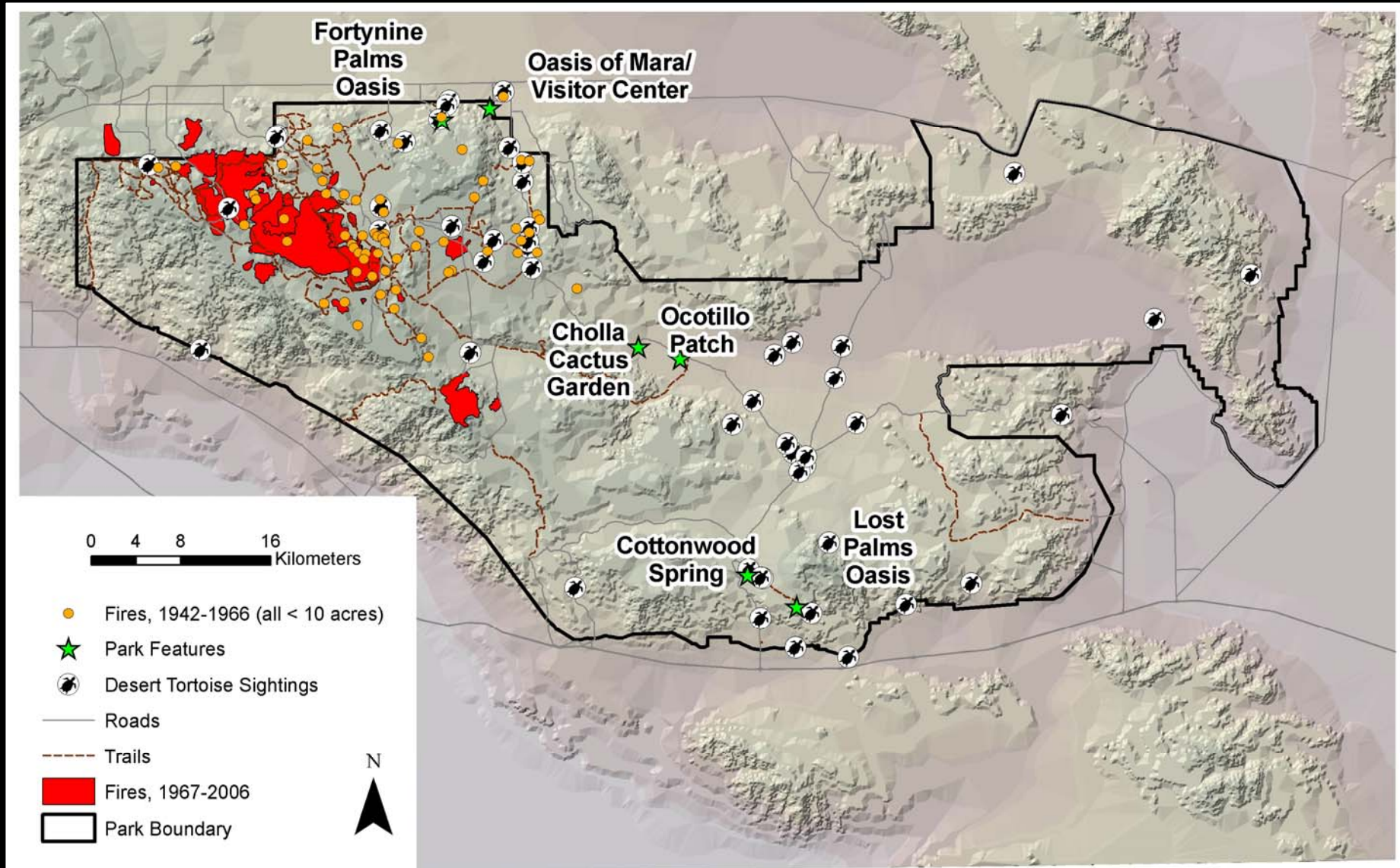
**Potential loss of “transitional” environments**



***“When it rains, it pours”***

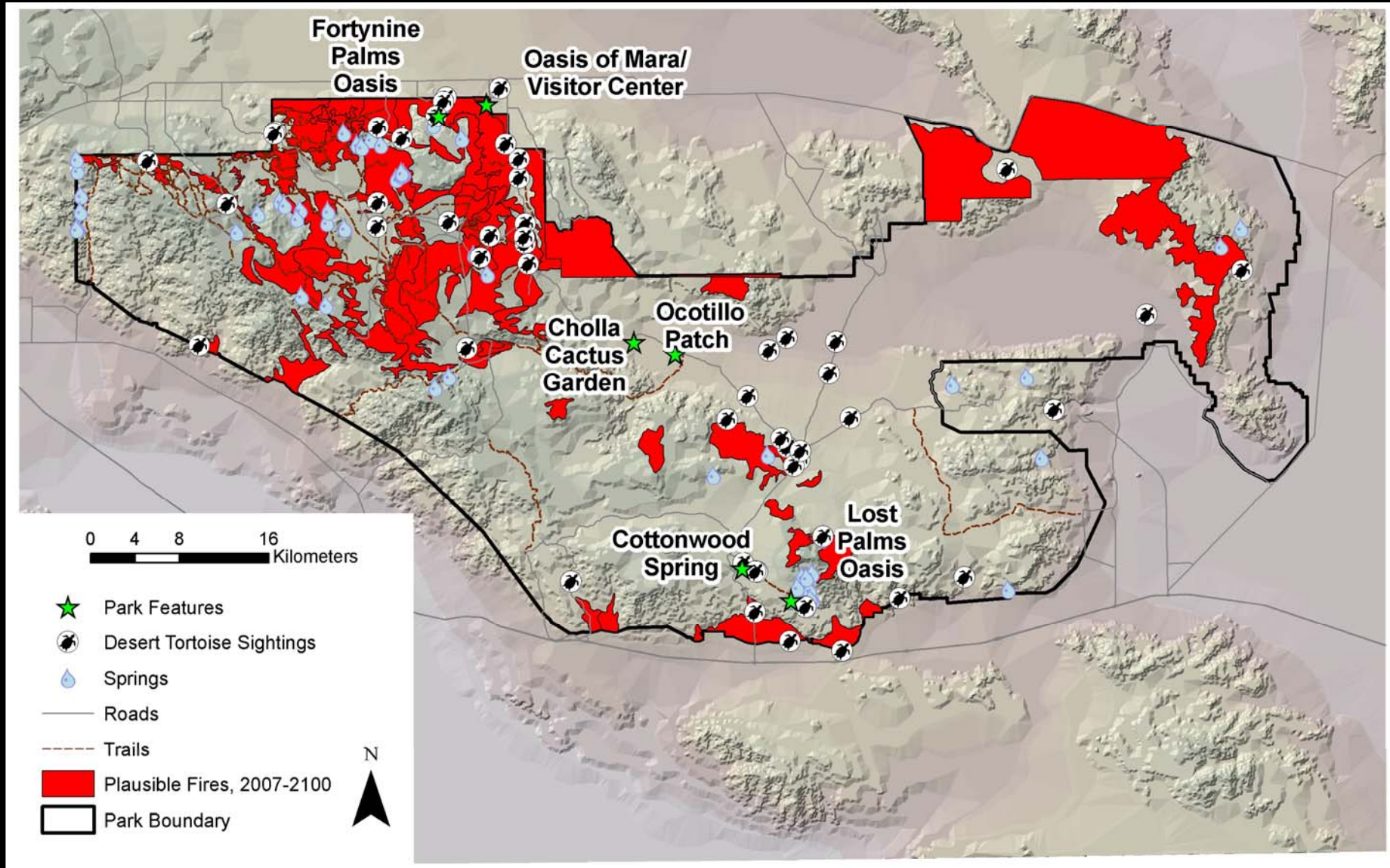


**Fires, 1967-2006: Approx. 40,000 acres burned**



***“When it rains, it pours”***

**Plausible future fires: Approx. 600,000 acres burned**



***“When it rains, it pours”***

**Extensive conversion to non-native grasses**





## ***“Dune”***

**Persistent and extensive drought; loss of woody species**





## ***“Dune”***

**Increased erosion; loss of vegetative cover; dune formation**

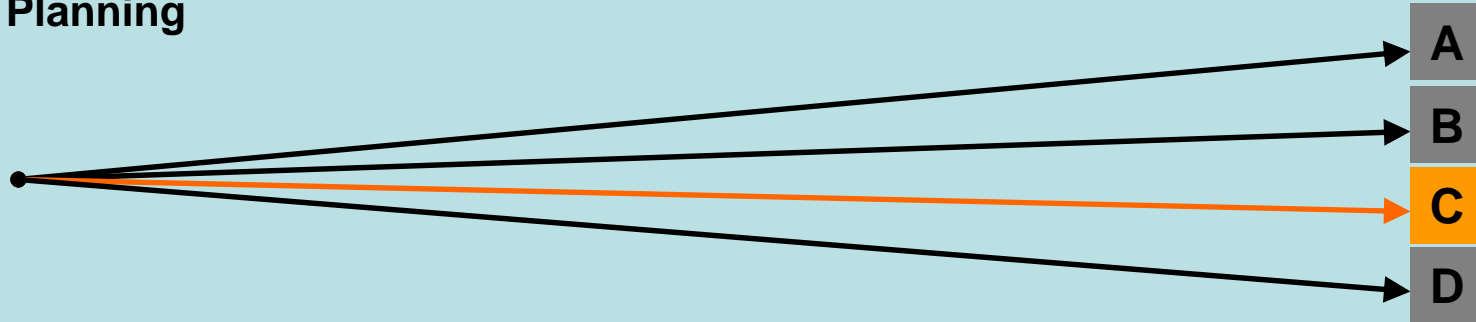




# One Dimensional vs Scenario Planning

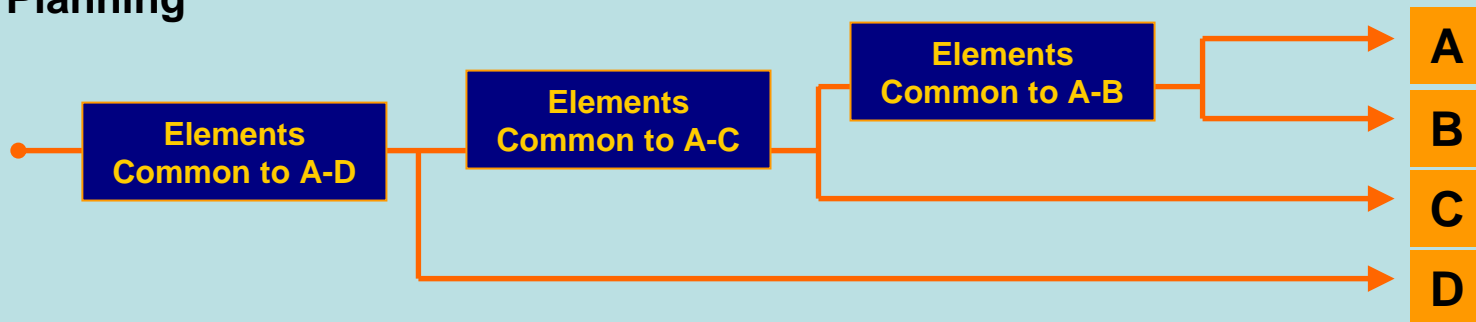
## One-Dimensional Planning

## Outcomes



## Scenario Planning

## Possible Futures





I hope this Climate Change  
doesn't wilt all the good lettuce!!!

